

## **Stock assessment and restoration of the Afognak Lake sockeye salmon run**

**Abstract:** Afognak Lake sockeye salmon *Oncorhynchus nerka* runs declined substantially in 2001 and subsequent escapements from 2002-2004 have been well below the escapement goal. Responding to concerns from local subsistence users, the Alaska Department of Fish and Game began investigations of the lake's rearing environment. With successful completion of a one-year mark-recapture feasibility study to estimate smolt abundance in 2003, a three-year study (2004-2006) to continue the smolt abundance estimates and assess rearing and spawning habitats was funded. During 2005, the third year of operation, 73,697 sockeye salmon smolt were captured using a Canadian fan trap operated from 10 May to 27 June. Using mark-recapture techniques, we estimated that 560,230 sockeye salmon smolt (95% C.I. 486,554 – 633,906) emigrated from Afognak Lake. The population was composed of 521,025 age-1. and 39,205 age-2. smolt. Age-1. smolt had a mean weight of 3.9 g, a mean length of 76.8 mm, and a mean condition factor of 0.84. Age-2. smolt had a mean weight of 4.2 g, a mean length of 81.3 mm, and a mean condition factor of 0.77. Five limnology surveys were conducted in Afognak Lake from May to September, 2005. Seasonal water chemistry and nutrients concentrations were consistent with historical data collected from Afognak Lake. Afognak Lake is considered phosphorus limited. Seasonal zooplankton density averaged 116,764 animals per m<sup>2</sup>, and cladocerans comprised 61.2% of the zooplankton sampled. The cladoceran *Bosmina* was the most abundant zooplankter, while *Epischura* was the most abundant copepod. The spawning habitat in major and minor tributaries surrounding Afognak Lake was evaluated in the fall of 2005. Based on the total tributary survey there is enough available spawning habitat to support an estimated 15,297 sockeye salmon. Aerial surveys of lake shoal spawners of Afognak Lake were conducted on three occasions in August and September of 2005. The peak survey revealed a total of 770 spawning sockeye salmon spawning along the lake shoals. Rearing conditions within Afognak Lake appear to be stable or improving since lake water chemistry and nutrients were similar to historic levels, and zooplankton abundance did not suggest overgrazing. Favorable rearing conditions were also reflected in the relatively high condition factor of the smolt (>0.70) that enabled most of them to emigrate at age-1.

**Citation:** Baer, R.T., S.T. Schrof, and S.G. Honnold. 2006. Stock assessment and restoration of the Afognak Lake sockeye salmon run. U.S. Fish and Wildlife Service, Office of Subsistence Management, Fisheries Resource Monitoring Program, 2006 Annual Project Report (Project No. 04-412). Alaska Department of Fish and Game, Division of Commercial Fisheries, Kodiak, Alaska.